ATTACHMENT 6

NELSON'S STERLING SILVER CUP SELF SUSTAINING FISH FOOD

Friday, November 10, 2000

Ms. Carolyn Brickey, Chairperson
National Organic Standards Board
c/o Mrs. Toni Strother
USDA-AMS-TMS-NOP
Room 2510-So., Ag Stop 0268
P O Box 96456
Washington, D.C. 20090-6456

Re: November 15, 2000
NOSB Meeting
Public Comment

Subject: Organic aquaculture standards

Dear Ms. Brickey,

It has indeed been a privilege working with Ms. Margaret Wittenberg on the NOSB Aquaculture Working Group, as well as my fellow colleagues appointed to the group. We have worked well together, been in constant internet dialogue and have covered several very difficult and sensitive topics; which will be formally presented to the NOSB on Friday, November 17th.

I wish to offer a few words of personal comment for the NOSB to consider.

On the matter of the use of wild, harvested fish meal from sustainable fisheries; I would guess that on Wednesday, November 15, 2000 you will be hearing from, at least, a few members of advocacy environmental organizations calling for a ban or restrictive use of such product(s).

I will respect the NOSB ability to exercise sound reasoning on whether to include such products into the standard on the grounds of organic certification.

Unfortunately, recent information promulgated by certain environmental advocates and appearing in the public forum is full of erroneous information that has received prompt challenge from the aquaculture community. To date, I am not aware of any of the authors responding to those challenges.

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Members of our own Aquaculture Working Group requested that at least one of the authors, NOSB-member Becky Goldburg, continue the dialogue by responding to these challenges, in hopes that a persistent exchange of facts and questions would result in some greater degree of truth and understanding to this adversarial dilemma. That did not happen. My caution to any member of the NOSB is, if they have accepted the article appearing in the Nature magazine, by Naylor et al, as an official or authoritative verdict on aquaculture; I would be very disappointed in anyone's naivete in having reached that conclusion so quickly. I would encourage that person to continue their search for the truth.

Finally, one of the more obvious facts that surfaced during our discussions is that aquaculture is unique, having it's own set of principles that often lack similarity to what most NOSB members have seen in their twenty plus years of experience in terrestrial plant and animal agriculture. The vernacular is not readily, laterally transferable. Our group repeatedly went back to looking at underlying principles to form new conclusions. Remember, too, that organic agriculture has been fairly safe in dealing with plant and animal production that draws upon organically certifiable plant foodstuffs and fertilizers to nourish plants and plant-eating animal species. I would have to inquire as to when the NOSB last examined standards for a predatory species, whose lifestyle is not typically pastoral?

In spite of day to day problems, the group performed its assignment very well and I congratulate them for their persistence and synergy.

Yours truly,

Richard C. Nelson

Richard C. Nelson, President

encl.

<u>A response to the article in *Nature* article by Naylor *et al*, Vol 405, 29 June 2000</u>

Dr. Reid Hole, Director of Technology and Development, Nutreco Aquaculture

First of all, Nutreco welcomes the recognition in the paper in *Nature* (Naylor *et al.* Vol. 405, 29 June 2000) that aquaculture is in a position to supplement global fish supplies and provide food for the world's growing population over the long term. Nutreco agrees that the successful further development of sustainable aquaculture requires a constructive partnership and shared vision between the public regulators and private enterprise. Nutreco, however, believes that some of the observations and conclusions presented are based on misconceptions and incomplete information.

<u>Supplies of fish meal and fish oil</u>

A key area of confusion is the scale and significance of the wild fish catch used for fish meal and fish oil that is then used in the preparation of compound feed for intensively farmed carnivorous species such as salmon.

In the section *Fishing down and farming up the web*, (p. 1018, column 2) the paper states that "most ocean fishery stocks are now recognised as over or fully fished", quoting a 1999 report of the USA National Research Council (NRC) as the reference. Later in the section (p. 1019, column 1, last para.), the paper states that "the aquaculture industry cannot continue to rely on finite stocks of wild-caught fish, a number of which are already classified as fully exploited, over exploited or depleted", again quoting the NRC report and also quoting the FAO 1998 report *The State of World fisheries and Aquaculture*. Nutreco agrees with the principle that aquaculture must look beyond the finite stocks of wild caught fish in order to continue its expansion in the long-term and has been investing in research to this end for some years.

In fact, the FAO report concludes that 16% of fisheries are over fished. These are all species fished primarily for human consumption. The species classified as over fished tend to be long-lived, slow-growing fish and the NRC report points out that they are less able to support high exploitation rates than the faster-growing, short-lived species predominantly used for fish oil and fish meal.

The species most used for fish oil and fish meal are the pelagic fish caught off the coast of Peru and Chile. In a later section, *Food web interactions*, (p. 1021, column 1), the paper incorrectly specifically states that many of these species are over fished. Both countries have tight government controls on fishing and fishing stops are imposed and policed through boat tracking systems in order to prevent over fishing. They actively manage their fisheries, maintain close contact with international organisations that monitor fish stocks and conduct their own research.

The 1998 El Niño was one of the worst ever and had a significant impact on the fish numbers in this region. However, once it was over the pelagic fish stocks recovered rapidly through a combination of the nature of the fish (fast-growing, short-lived) and the protection afforded by the governmental controls, demonstrating the sustainability of this resource. Recent data from IMARPE, the Peruvian Government's research unit responsible for monitoring fish stocks, confirm that the anchovy resource (used in fish meal and fish oil production) is in sound biological condition. Current catch statistics support this conclusion.

Nutreco has specific rules in place concerning the purchase of raw materials from wild-caught fish stocks. First, it checks that the national fishing fleet of the country concerned complies with all relevant national and international regulations. Secondly it checks the individual fishing company for compliance with these rules and all applicable quotas. If these criteria are not met, no purchase is made. Finally, if it has reason to think that the fish on offer have come from a species where the quota for that region has been exceeded, it will not purchase. For example, the Jack mackerel stocks off the coast of Chile are under strict quota limits as they may have been over fished in the past. Nutreco Aquaculture is keeping a close watch on fishing of this species and would not buy should these quotas be exceeded.

Later in the section *Fishing down and farming up the web*, the paper makes the assumption that taking efficiency arguments to their logical conclusion "that ever increasing amounts of small pelagic fish should be caught for use in aquaculture feeds to expand the total supply of commercially valuable fish" (p. 1019, column 1, last para.) and states this would be disastrous for marine ecosystems. This is not necessarily the logical conclusion and the history of catches of small pelagic fish does not bear out this assumption. By the paper's own statements it is clear that the supply of commercially valuable fish from aquaculture has expanded dramatically over the past 15 years. Over the past 20 years, the catches of small pelagic fish have remained more or less constant. There is no upward trend.

Worldwide fishing is stable at around 95 million tons and about one third is used for fish meal and fish oil, supplemented by the trimmings from the processing of fish for human consumption. The proportion of the total catch used this way has not changed during the expansion of commercial aquaculture. This is because the level of fish meal in fish feed has been reduced as better diet formulations have been developed.

Total fish meal production is around 6.5 million tons of which aquaculture is using 2 million tons. Total fish oil production is between 1 and 1.2 million tons and aquaculture uses 40% of this. Should further expansion of aquaculture raise demand for fish meal and fish oil, it is far more likely that this will be achieved through a shift of markets.

At present the other two-thirds of the fish meal production is used in feed for land animals. An increase in the tonnage of fish meal used for fish feed is far more likely to come through a reduction in the amount used for pig and poultry feed rather than through an increase in either the pelagic fish catch or an increase in the proportion of the total catch used for these products.

The situation for fish oil is different and here the extra demand is most likely to be met through the addition of vegetable oils — an area that is being thoroughly researched, as is described later in this text.

The one-third proportion of the total fish catch used for fish meal and fish oil is very largely made up of the small, bony pelagic fish that are not suitable for human consumption. This is in contradiction to the statement made in the paper that "the appropriation of aquatic productivity for fish feed reduces supplies of wild fish that could potentially be consumed directly," (p. 1020, column 1, lines 1–3). There have been attempts to produce significant quantities of food for human consumption directly from these supplies but all to date have proved uneconomic. It is possible that some of these fish will go into canning in the future but this supply is expected to be compensated for by use of the by-catch as satellite technology and trackers are increasingly used to ensure fishing vessels land the by-catch rather than discard it. This is a potentially difficult area as often by-catch contains species the fishermen are not allowed to catch but it can be argued that once caught it is better they are used either for consumption or as a source of fish meal and fish oil than thrown back into the sea. Also, we believe there is still potential to increase significantly the contribution made from the by-products of the fish processing industry if greater attention is paid to this.

The absence of increasing pressure on the supplies of fish meal and fish is reflected in their prices, which are relatively stable. This does not concur with the statement in the paper that "fish meal prices have risen in real terms in the past three decades and are likely to increase further with the increase in demand," (p. 1022, column 1, para. 2).

<u>Efficiency of feed conversion in aquaculture</u>

Naylor *et al.* show some misconceptions concerning the input of fish meal and fish oil in the production of fish such as salmon. The paper states, "production of a kilogram of carnivorous fish can use up to 5 kg of wild fish." The figure of 5 kg input/kg produced is based on reference 16, Tacon, International Aquafeed Directory 1998. Table 2 of the paper in *Nature*, page 1019 gives a figure of 3.16 kg wild fish per kg farmed salmon. The only figures at or near 5kg are for marine fin fish other than salmon and including flounder, halibut, sole, cod, seabass and tuna, and for eel. The original paper was checked and they have taken the most extreme example, which is unlikely ever to apply as it would be uneconomic.

The calculation of 3.16 kg wild fish per kg farmed salmon appears to be based on the following assumptions; the water content of wild fish used is 80%, the inclusion rate of fish meal in the diet is 45% and the food conversion rate (FCR) of farmed salmon is 1.5. Nutreco Aquaculture research and production statistics provide different figures.

The fish species used for fish meal production contain about 75% water (25% dry matter), meaning that 5 kg yields 1.25 kg of dry matter (protein, fat, minerals etc.). With a protein content of 17% in the 5 kg of fish, the yield will be 850 gram of protein and 350–500 gram of oil. The lower figure applies to lean species caught off South America and the higher to those caught in the North Sea.

A typical fish feed contains 40% protein (400 grams per kg). If all the protein in the diet were to come from fish meal, 2.35 kg of round fish would be needed, less than half the 5 kg quoted. Similarly for fish oil, a salmon diet with 30% oil needs about 4 kg of fish for 1 kg of grower diet to satisfy the demand for oil in the diet, if all the oil is fish oil. It should be noted that feeds for carnivorous species such as sea bass and sea bream have an oil content of 20–22%, and that starter feed start at 10–12% oil. Grower diets for fresh water rainbow trout are also lower in oil than those for salmon (at 23–26%). The reason for the lower figures for the sea bass and sea bream is that these are leaner fish while fresh water rainbow trout is harvested at a smaller size (typically 300–500 grams). Therefore, they can be grown on a diet lower in oil, though normally these will be in the area of 45–50% in protein. The net result is that for a company such as Nutreco the tonnage of oil required for feed is less than 25% of the total feed output.

Concerning the amount of fish meal used to produce 1 kg of fish feed, this is now typically 25–35%.

For efficiently grown salmon, the FCR is typically 1 (1kg feed/kg fish produced). With a modern diet containing 25% by weight of fish meal, 1 kg of salmon is produced using 250 g of fish meal, which was obtained from 1 kg of live fish, not five. Farming of Atlantic salmon is known to be the most efficient segment of aquaculture. Modern farms can operate with a biological FCR down to 0.85, and the world average economic FCR, measuring the feed used and the weight actually harvested, is 1.2–1.3.

Using the figures of 75% water, 30% fish meal inclusion and an FCR of 1.2, it takes 360g of fish meal, equivalent to 1.44 kg of raw fish, to produce I kg of farmed salmon. Applying the correction factor quoted in the paper that allows for 1/16th of the fish meal to have come from fish processing, the figure is further reduced to 1.35 kg of wild fish per kg farmed salmon and not the 3.16 kg quoted.

The authors also state, "semi-intensive systems use 2–5 times more fish, in the form of fish meal, to feed farmed species than is supplied by the farmed product".

The average FCR in semi-intensively farmed fish e.g., milkfish, is 6. The typical fish meal inclusion level is 10%. Therefore, production of 1kg of milkfish requires 600g of fish meal, equivalent to 2.4 kg of live fish, assuming 75% water content. Better training of the all the stakeholders would bring a significant reduction to this FCR and reduce the fish meal input per kg fish produced.

The conclusion is that semi-intensive systems require a maximum of 2–3 kg of largely inedible, bony, pelagic fish and fish trimmings per kilo of edible fish produced and intensively reared salmon requires less than half that amount for fish meal per kilo production.

Due to the fact that most species used for fish meal and fish oil production have less than half the fat content of salmon, it is obvious that more fish is needed to produce the amounts of oil needed to grow a salmon by 1 kg. Nevertheless, it is possible to go down to 2 kg wild caught fish per kg carnivorous fish grown in fish farming by using existing knowledge, when calculating for fish meal requirements.

It should be noted that salmon are far more efficient at using the energy and protein resources they are fed than terrestrial livestock; retaining some 27% energy and 30% of the protein compared with 12% and 18 % respectively for chicken and 16% and 13% for pigs.

Research

Nutreco endorses the view presented in the paper that the future growth of aquaculture cannot rely on the wild catch of fish alone and came to this conclusion some ten years ago. Therefore, the company has been working with scientific institutions in Canada, Chile, Japan, Norway, the UK, Malaysia, Spain and France since 1991 to carry out research with the objective of replacing as much fish meal with vegetable protein sources as possible in diets for the different carnivorous species.

As a result, fish meal inclusion rates in the diet are now down to 25%, while maintaining as good or even better growth, FCR and fish health as achieved with on diets where all protein comes from fish meal. The protein content of the modern diets is around 40%, which means that only 42% of the protein is from fish meal.

Nutreco is continuing this research with the objective of further reductions and promising results are being achieved.

Starting in 1996, Nutreco initiated research on the replacement of fish oil in commercial, nutrient-dense, high-performing fish feeds for carnivorous species. If necessary, up to 65% of the fish oil can be replaced with vegetable oils without sacrificing growth, FCR or health in the fish, but the fatty acid profile of the fish will change. Taste panels had, in principle, no negative comments on fish fed these diets, except that the "fish taste" was less pronounced. They also reported less rancid taste and slightly better visual colour for fish fed diets rich in vegetable oils, which is judged to be positive. It should also be noted that a significant amount of the oil in the feed is used as an energy source for the metabolic processes.

Nutreco can therefore replace significant amounts of fish meals and fish oils in the diets for carnivorous fish, but the level is very much determined by the expectations of consumers as well as the retailers and others buying the fish from Nutreco.

It would seem, therefore, that Nutreco and the other responsible fish feed manufacturers are ahead of the recommendations in the paper for exploration of alternative sources as this has been an active pursuit for the past decade.

The paper talks on p. 1022, column 1, para. 4, of "substituting fish oil with cheaper vegetable oil in aquaculture feeds," This does not make much sense at present as fish oil is cheaper than vegetable oils.

Efficient formulation and use

Nutreco agrees that more knowledge is needed to meet the requirements for essential nutrients in different farmed species, independent of whether they are carnivorous, omnivorous or herbivorous. No responsible, commercial company intentionally over-formulates feed. The feed business is highly competitive and over-formulated feeds would be more expensive for no extra benefit to the farmer and thus commercially unattractive to both parties. Further, no responsible fish farmer will overfeed the fish as that would increase costs for no benefit and would lead to problems of pollution. Both over-formulation and over-feeding would be contrary to the intentions of a sustainable industry.

Nutreco is investing heavily in R&D to make the products as efficient as possible, from the formulation, cost and environmental points of view. The Nutreco Aquaculture Research Centre was established in 1989 and to date Nutreco Aquaculture have invested US $70–80 millions in researching the requirements for essential nutrients in carnivorous fish species. A significant amount of this has been spent with leading research institutions around the world.

Well-balanced feed will always give the healthiest fish and will also have the lowest environmental impact. These feed products also make the best use of the raw materials.

Environmental issues

The paper raises a series of points concerning ecological links between aquaculture and wild stock. These are habitat modification, the use of wild seed to stock aquaculture ponds, food web interactions, the introduction of non-indigenous organisms, and effluent discharge.

Habitat modification: Nutreco has no farming activities in the coastal wetland areas referred to and therefore has no part in the habitat modification discussed.

The use of wild seed: Nutreco farming activities are entirely closed-cycle, that is using only fish bred specifically for the farms, mostly within the company's own facilities. Nutreco Aquaculture conducts active breed improvement programmes through selection of best performers in the traditional manner of both aquaculture and agriculture and is not involved in any form of genetic manipulation.

A very small amount of Nutreco fish feed production, less than 2%, supplies the eel and yellowtail farming activities that are not closed cycle. The technology to close the cycle exists but the deciding factor in the choice at present is economic. Action by regulatory bodies could change the equations.

Food web interactions: refers to the use of fish for fish meal, which has already been discussed.

The introduction of non-indigenous organisms: refers to the effects of escaping stock and the spread of pathogens. The paper states that "Atlantic salmon… frequently escape from net pens." First, it should be noted that fish farmers lose money whenever a fish escapes and therefore will do their utmost to prevent this. In Norway, for example, less than 0.5% of total farmed fish population escapes. These escapes happen mainly during handling procedures and a programme has been put in place to reduce the rate of escape by 50% over the next two years. In Nutreco's own farming operations, the escape rate is half the industry average.

Salmon farming is a young activity: the first fish was harvested in 1971. Therefore, there is no substantial genetic difference between the farmed and the wild fish. But their behaviours are different. The wild fish is a predatory animal while the farmed is used to being fed. That is a disadvantage for the farmed fish if they come outside the cage and many escapees stay around the cages to get feed, and then they are caught again. Some do adapt to natural conditions and spend time out in the oceans to grow and mature before they return to the rivers to spawn and do introduce a small level of genetic drift. It should be noted that under wild conditions, not all fish migrate back to the rivers where they were born, so there is a natural genetic drift.

The pathogens encountered in aquaculture are endemic in the waters and have been there for millennia. In nature, one only ever sees survivors, so most diseased wild fish go unrecorded. Fish farming gives a clear impression of fish health and fish are identified and diagnosed when sick. Only well-managed health programmes can contribute to improved fish health. Norway sets the example and Nutreco Aquaculture has taken a lead in transferring best practises to other areas and species.

It is a myth that high stocking densities of intensive production will induce diseases. The occurrence of disease is more related to management practise (feed and health management). Also preventative health management is in the interest of the farmer as healthy fish is growing better and he will avoid expenses for medication.

Intensive aquaculture is a knowledge based and high technology activity with a higher net retention of inputs per unit produced and reduced potential for spread of diseases, compared with either extensive or semi-intensive methods of production. Salmon farming in Norway is using about 2 grams of antibiotics per ton fish produced, effective proof that intensive and efficient farming can manage the health of the fish via good husbandry methods, vaccination and proactive health management when supported by all stakeholders, including the authorities. Disease problems are actually much worse under extensive and semi-intensive conditions today.

Effluent discharge: it is not in the interest of the fish farmers to pollute the environment in which they are working as their fish would be the first to suffer from bad environmental conditions. The effluent from modern farming is very low, about 100 gram of dry matter per kg fish grown. Also, this is spread over large areas, so the impact is almost zero. There is a trend in modern aquaculture for farms to move from shallow waters, such as the Norwegian fjords, to more exposed areas. This reduces impact on coastal areas and increases dispersion rates through heavier currents.

In Nutreco Aquaculture farming operations, it is standard practise for farms to be left fallow after the fish have been harvested (for 2–4 months as a minimum). This is done to make sure that the seabed is restored, that the benthic fauna is maintained and that all pathogens (if any at all) have disappeared through a lack of hosts. It may not always be necessary to use a fallow period, or may be possible to use a shorter period, in some deeper water, more exposed and isolated sites. This decision is the responsibility of local management, depending on local and national regulations and the prevailing circumstances. If there is any doubt, a fallow period will be used. It is in the interest of the local manager to do so as his fish would suffer first should there be any subsequent problems.

Even by the calculations of Naylor *et al.* aquaculture is making a net contribution of 19 million tons. With the wild catch remaining more or less static, this increasing supply is meeting a growing worldwide demand for fish rather than substituting for wild catch. It does mean that aquaculture enables the demand to be met without resorting to further over fishing of natural stocks. For example, farmed white fish have helped fill the gap left by a decline in the wild catch of fish such as haddock and cod over the past decade.

Asia accounts for about 90% of world aquaculture production and that is where the biggest problems today are located. Most of their fin fish farming activities are extensive, but moving towards becoming semi intensive. There are shrimp activities in all three categories — extensive, semi-intensive and intensive. In shrimp farming all categories are facing significant health problems due to a heavy trade in live animals and poor health management practises. Many of the inefficiencies in production and health problems are related to the fact that they don't manage reproduction of the species (the reproduction cycle is not closed).

Modernisation of aquaculture in the developing countries of Asia and elsewhere to reach the standards seen in salmon farming would do much to address the criticisms directed towards this part of the food chain. Further, the demand for fish is such that efficient aquaculture not only produces needed food, it also generates employment, directly and indirectly, and income in rural and coastal areas that may have few other opportunities to improve standards of living. Programmes aimed at educating fish farmers in more efficient and sustainable practices would probably have great beneficial impact. Nutreco is already involved in this as the company transfers its own experience from salmon farming to the other fin fish species for which it is manufacturing feed and it sees a need to support the development of sustainable aquaculture on a global scale in the interests of us all.

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